BEFORE THE
POSTAL RATE COMMISSION
WASHINGTON, D. C. 20268-0001

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POSTAL RATE AND FEE CHANGES, 2000 :	Docket No. R2000-1

RESPONSES OF MAGAZINE PUBLISHERS OF AMERICA, INC.
WITNESS CROWDER TO INTERROGATORIES OF THE
UNITED STATES POSTAL SERVICE (USPS/MPA-T5-1-3)

(June 23, 2000)

The Magazine Publishers of America hereby submits the responses of witness Crowder to interrogatories USPS/MPA-T-5-1-3, filed on June 9, 2000. Each interrogatory is stated verbatim and is followed by the response.

Respectfully submitted,

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USPS/MPA-T5-1. Please refer to your testimony at page 48, line 3-6. You state that:

> When volume on a route increases and there is less than 100% delivery coverage on the stop, then some of the volume goes to newly covered stops/deliveries (causing whatever fixed stop/delivery time is appropriate) and average volume for all covered stops/deliveries on the route decreases.

In what sense is the fixed stop/delivery time that you mention "fixed"? For example, is it fixed with respect to a specific variable, such as volume? Is it fixed in the much stricter sense that it is the exact same amount of time at every newly covered stop or delivery point, regardless of whether that new stop or delivery point is a curbside, centralized, walk-up location, etc., and regardless of container and receptacle type? Please explain fully.

RESPONSE:

The fixed time to which I refer is fixed per stop. Assuming a stop must be accessed or covered, then fixed time is the portion of time at that covered stop which does not vary with stop volume. Although not associated with volume, I do not mean to imply that it is a constant value from stop to stop, regardless of stop characteristics. Fixed stop time will vary according to stop workload characteristics and even within groups of stops where combinations of characteristics are constant, fixed stop time will vary for other unexplained reasons. As with any random variable, the proper measure for fixed stop time is its expected value, or average of values from a data set if the individual fixed stop times can be properly isolated.

USPS/MPA-T5-2. Please refer to your testimony at Appendix B, pages 9-10, including footnote on page 10.

(a) Refer in particular to your statement at Appendix B, page 9 that the positive load time at zero volumes estimated by the route-level regressions "is clearly nonsensical at the route level..." Is it your contention that it makes sense for significant fixed load time to exist at an individual covered stop, but that it is "nonsensical" for fixed load time to exist at a group of covered stops that make up a section of a route or an entire route? Please explain fully.

(b) In Appendix B, page 10, footnote 9, you state: "At the stop level, the cost-volume curve does have a positive intercept, indicating fixed stop time."

(1) Is this "fixed stop time" true load time, or should it be allocated to a different (non-load) out-of-office component? If it should be allocated to a different (non-load) out-of-office component, which component and why?

(2) Is this "fixed stop time" coverage-related load time? Please explain fully.

(3) How would you measure the volume-variability, if any, of this "fixed stop time?"
Please explain fully.

(c) Consider the definition of coverage-related load time as the residual of total load time at a stop minus elemental load time at that stop. Is coverage-related load time, based on this definition, the same as the "fixed stop time" that you refer to in the portion of Appendix B, page 10, footnote 9 that is quoted in interrogatory 3(b) above? Please explain full why or why not.

RESPONSE:

(a) As long as stops require access for mail delivery, if non-volume variable stop load time activities exist, then I would expect to observe fixed stop load time at each covered stop. The portion of total load time for all these covered stops that can be categorized as non-volume variable or fixed is the summation of the individual fixed stop load times. Now assume for the moment that the collection of covered stops define a route. Then we have a route with 100 percent coverage; and it is clearly non-sensical to believe that if all volume on that route is eliminated, there will be any fixed stop load time remaining. The simple reason is that at zero route volume, all fixed stop load time must be eliminated because there are no covered stops.

Mathematically, the demonstration is straightforward. Assume a constant per stop marginal load time (u), fixed stop time (f), route volume (V), route actual stops (AS), and route possible stops (PS). Total load time on the route can then be explained by:

$$L = V * u + AS(V, PS) * f, \qquad (1)$$

where V * u is the sum of stop level variable load time, AS(V, PS) is actual or covered stops explained as a function of V and PS, and AS(V, PS) * f is the sum of stop level fixed load times. If V = 0, then 0 = AS(0, PS) and we have:

$$L = 0 * u + 0 * f$$
$$= 0.$$

Zero route volume must produce zero route load time. The 0 = AS(0, PS) result is clear from the Service's own exponential coverage-related function $AS = [1 - e^{r\,(V/PS)}] * PS$. Substituting V = 0 in the formula gives:

$$AS = (1 - e^{0}) * PS$$
$$= (1 - 1)*PS$$
$$= 0.$$

In addition to passing through the origin, I mentioned in my testimony that the route load time-volume curve is curvilinear, exhibiting declining marginal costs. To show this, use

$L = V * u + [1 - e^{r\,(V/PS)}] * PS * f$ to indicate route level marginal load cost as:

$$dL/dV = u - (r/PS)*e^{r\,(V/PS)} * PS * f$$
$$= u - e^{r\,(V/PS)} * r * f.$$
$$> 0,$$

since r < 0. The expression shows route level marginal load time as the sum of two components: (1) unit piece handling and loading costs at the delivery point (u); and

(2) the marginal increase in fixed stop time caused by part of volume gains going to new stops ($-e^{r(V/PS)} * r * f$). As route coverage becomes higher (more stops are covered), the effect from this second term decreases because volume gains become increasingly diverted to existing stops.[1] Differentiating the marginal cost expression again gives:

$$d^2L/dV^2 = -e^{r(V/PS)} * r^2 * f/PS < 0,$$

indicating declining route level marginal load costs. The source of the decrease is the lower incidence of actual stops (and fixed stop time) creation as route volume increases.

1 From $AS = [1 - e^{r(V/PS)}]*PS$, then $e^{r(V/PS)} = 1 - AS/PS$. Then substitute into $u - e^{r(V/PS)} * r * f$ to get $dL/dV = u - (1-AS/PS) * r * f$. As route coverage AS/PS increases, the coverage-related effect on marginal load time, $-(1-AS/PS) * r * f$, decreases. At 100 percent coverage, the term is zero and marginal load time is fully explained as the stops level effect u.

(b) Please see my explanation of "true load time" in response to USPS/MPA-T5-4.

(1) Fixed stop load time is a component of route load time as I show in (1) above.

(2) Fixed stop load time might explain part or all of coverage-related load time.

I described a particular example of the coverage-related effect above, where unit handling and loading costs (u) are constant. With constant unit handling and loading costs, a component of the total load time increase from added route volume is greater stop-level fixed time as more stops are accessed for delivery. However, changes in the number of covered stops can also affect unit handling and loading costs (u). In particular, if there are scale effects in the variable portion of route load time (all load time costs less the sum of the fixed amounts for all route stops), then concentration of route volume in a lower number of actual stops lowers (u) and a dispersion of the same route volume over a higher number of stops increases (u). When variable load time scale effects exist, total route load time will be affected by three factors: (1) route volume, (2) stop level fixed load time which varies with actual stops, and (3) unit piece handling and load time (u) which is also affected by route actual stops and by volume because of the variable scale effects.

(3) To evaluate volume-variability of the route-level load time function, indicate unit piece costs as the function u[V, AS(V, PS)] and then rewrite (1) into the more general expression:

$$L(V, PS) = V * u[V, AS(V, PS)] + AS(V, PS) * f,$$

where $\partial u/\partial V < 0$ with scale economies in variable load time and $\partial u/\partial AS > 0$ because of loss of these scale effects when route actual stops increase. Total marginal costs with respect to volume are then:

$$L_V(V, PS) = u + V * [\partial u/\partial V + (\partial u/\partial AS)*(\partial AS/\partial V)] + (\partial AS/\partial V) * f.$$

$$= u + V * \partial u/\partial V + (\partial AS/\partial V)*(V * \partial u/\partial AS + f). \qquad (2)$$

Total marginal costs are shown as the sum of the increase in route variable load time $u + V * [(\partial u/\partial V + (\partial u/\partial AS)*(\partial AS/\partial V)]$ and the additional fixed stop time caused by a unit volume increase $(\partial AS/\partial V) * f$. The variable load time increase is itself the sum of (u), or the increase that would occur if (u) were held constant, and $V * [(\partial u/\partial V) + (\partial u/\partial AS) * (\partial AS/\partial V)]$, the effect from the change in (u) caused by additional route volume and actual stops. This adjustment to (u) requires further explanation.

The marginal effect $\partial u/\partial V < 0$, indicating scale economies in piece handling and loading, signifies that if all route volume increases go to already covered stops, unit costs will decline because each additional piece requires less time to handle and load. In other words, marginal costs for handling pieces at existing stops is declining. On the other hand, if the increase in volume means existing route volume is distributed over a greater number of stops, then $\partial u/\partial AS > 0$, indicating that unit costs increase because of a loss of these scale effects. Normally, volume gains get distributed to both existing and new stops, so that both effects are evident. However if volume increases proportionately more than actual stops on a route (average stop volume on the route increases), then the net effect on (u) from a route volume increase will be negative, implying $\partial u/\partial V + (\partial u/\partial AS)*\partial AS/\partial V < 0$. In other words, scale effects from part of the volume gain going to existing stops are not completely offset by the remaining portion of the increase going to new stops. As long as average route stop volume increases, there is a net reduction in (u) because of declining marginal costs for handling additional pieces at existing stops.

The coverage-related effect on load time is also modified by the described scale effects. Another way to see the net reduction in (u) that is less than would occur if all volume gains went to existing stops is to recognize the term $V * (\partial u/\partial AS)*\partial AS/\partial V$ as a component of the coverage-related effect on load time, as indicated by the second expression in (2). The total coverage-related effect is then described by $(\partial AS/\partial V) * f + V * (\partial u/\partial AS)*\partial AS/\partial V$. The first term $(\partial AS/\partial V) * f$ is the marginal increase in fixed stop time and the second term $V * (\partial u/\partial AS)*\partial AS/\partial V$ is the marginal increase in route load time caused by a higher (u), relative to the lower value possible if the entire volume increase went to existing stops.

Route-level volume variability is then defined by:

$$L_V(V, PS) * V/L = [u + V*\partial u/\partial V + (\partial AS/\partial V)*(V*\partial u/\partial AS + f)] * V/L,$$

where $(u + V*\partial u/\partial V) * V/L$ is the non-coverage related or elemental load component and $[(\partial AS/\partial V)*(V*\partial u/\partial AS + f)] * V/L$ is the coverage-related component. The right hand side of the expression indicates the disaggregated form which shows the explicit impacts from the three effects I described earlier (from changes in volume, unit costs (u), and fixed stop time). The left hand side is the reduced or consolidated form of the expression which includes these disaggregated effects. It is important to note that the ES regression data used by the USPS only included route level volume and possible stop data so that any proper specification of a regression model that uses these data must be of the functional form L(V, PS). Thus route-level load time variability measured from such a model must be of the reduced form $L_V(V, PS) * V/L$, which must include all volume effects detailed on the right hand side, including all coverage-related effects initiated by the volume changes.

Separately, as I indicated in my testimony, the possible deliveries variable should be included in any route level regression to control for the separate effects of route possible deliveries on route load time. Since significant correlation between route level volume and possible deliveries can be expected, exclusion of this variable from regressions can be expected to artificially increase the sensitivity of load time to volume, thereby biasing the resulting volume variable load time measure. When possible deliveries are included in the regression model, the true direct and indirect effects of volume on load time (the latter taking effect via changes in actual stops/deliveries) can be isolated and included in the volume variable estimate. Under these circumstances, adding a possible deliveries variability to an already calculated volume variability undermines the very reason for adding the extra variable to the model. This treatment adds back the load time effect which would have been mistakenly considered part of volume variability in regressions which exclude the possible deliveries variable.[2]

(3) Please see my response to (2).

(c) As explained above, fixed stop time is part of coverage-related time, but, if there are any scale economies in variable load cost, then there is an additional component to coverage-related load time which needs to be recognized. This component relates to the loss of these scale effects when part of any volume increase gets distributed to additional stops.

2 Assume the correlation function PS(V) and substitute in the reduced function to get $L = L[V, PS(V)]$. Then L can be estimated as a function of V only in the regression model, but then the separate influence of PS on L would be wrongly attributed to V. Marginal load cost from model coefficients would assume the value of $dL/dV = \partial L/\partial V + (\partial L/\partial PS)*dPS/dV$ and variability would be $(dL/dV) * V/L = (\partial L/\partial V)V/L + [(\partial L/\partial PS) * PS/L] * [(dPS/dV) * V/PS]$. But this is exactly the estimate the Postal Service appears to be proposing in its latest load time analysis. It proposes adding the possible stops/deliveries variability $(\partial L/\partial PS) * PS/L$ (presumably under the assumption that $(dPS/dV) * V/PS = 1$) to the true volume variability, $(\partial L/\partial V)V/L$, that can be calculated from a regression model if possible stops/deliveries is added as a control variable. The USPS appears to confuse causation with correlation in somehow interpreting variations in PS as being "caused" by volume variations. Changes in route possible stops/deliveries are caused by population changes not by volume changes.

USPS/MPA-T5-3. Please refer to your testimony at page 44, line 1 through page 45, line 13. At page 45, lines 4-12, you make the following statements:

> The key point is that the intercept and intercept-related terms in both models represent relatively "fixed" time in the ES load time data (i.e., time that does not vary directly with number of possible deliveries). If the activities encompassed by the ES load time data only included true load time, then the intercept value and the coefficients for the other related terms would be close to zero and statistically insignificant. This result is expected for true load time, since zero possible deliveries should produce zero load time. Thus, this fixed time identified in the regressions should be considered non-load time that belongs in another out-of-office time component.

(a) Please specify the exact models to which you refer. Are the regressions referred to in this statement both the MPA ES regression and the USPS ES regression? Please explain fully.

(b) Are the "possible deliveries" referred to in this statement the deliveries recorded for the possible deliveries variables located on the right-hand side of the MPA ES regression? Please explain fully.

(c) Please refer to footnote 43 on page 44. Please confirm that each deliveries variable defined on the right-hand side of the MPA ES regression for a given delivery type represents the combination of actual deliveries for that delivery type and volume loaded at those actual deliveries. If you do not confirm, please explain fully in what sense each possible deliveries variable operates "as a proxy for volume and actual deliveries."

(d) Please see the last sentence of your statement form page 45, lines 4-12, quoted at the beginning of this interrogatory. Is the "fixed time identified in the regressions"

(1) the time predicted by the regressions at zero possible deliveries,

(2) the time predicted by the regressions at a combination of zero actual deliveries and zero volumes,

(3) neither (1) nor (2), or,

(4) both (1) and (2)? Please explain fully.

(e) Is it your view that the "fixed time identified in the regressions" cannot be load time because it is nonsensical that load time should be incurred on a route that has no actual deliveries and no volume? Please explain fully?

(f) Is it your view that the "fixed time identified in the regressions" cannot be load time because it is nonsensical that load time should be incurred on a route that has zero possible deliveries? Please explain fully.

(g) For what out-of-office time component would you expect to find positive hours on a route that has no actual deliveries and volume? Please explain fully.

(h) For what out-of-office time component would you expect to find positive hours on a route that has no possible deliveries? Please explain fully.

(j) Is the out-of-office time component that you identified in response to part (h) the other out-of-office time component to which you would assign the "fixed time identified in the regressions"? Please explain fully.

(k) Is the out-of-office time component that you identified in response to part (i) the other out-of-office time component to which you would assign the "fixed time identified in the regressions"? Please explain fully.

RESPONSE:

(a) I refer to both the MPA and USPS regression models. Both show that the ES load time estimate includes more than true load time.

(b) No. I assume you mean actual or covered deliveries when you use the term "deliveries recorded for the possible deliveries." The possible delivery variables on the right hand side of the MPA regression should be recognized as what they are exactly -- the sum of possible deliveries that are accessed for mail delivery (actual or covered deliveries) and possible deliveries for which no mail is delivered (uncovered deliveries). To my knowledge, actual deliveries are not reported in the ES data base. Since actual deliveries are caused by volume to be delivered, the reported volume variability in the USPS regression model recognizes the direct effect of volume on load time (assuming no changes in actual delivery) and the indirect effect (the change in load time transmitted through the change in actual deliveries, caused by the volume change).

(c) Not confirmed. As indicated above, the possible delivery variables in the ES data base are the sum of accessed and non-accessed delivery points for the corresponding delivery types. I am not sure what you mean by "volume loaded at those actual deliveries." The MPA ES regressions contain no volume data because such data were not filed by the USPS in time to allow their separate analysis and use in MPA regressions. MPA was then limited to using the available possible delivery workload data. However, even with this limitation, it is still possible to use route possible deliveries as a proxy for route volume and actual deliveries because actual deliveries are caused by volume and possible deliveries, as recognized by the USPS in their coverage models, and route volumes and route possible deliveries are correlated.

(d) For the USPS model, "fixed time identified in the regressions" is the time predicted by the regressions at zero volume and zero actual deliveries. Also please see my response to USPS/MPA-T5-2(a). For the MPA model, it is the time predicted at zero possible deliveries. With zero possible deliveries, there can be no delivery volume, actual deliveries or load time.

(e) Yes, without volume, there can be no actual deliveries and therefore there can be no load time.

(f) No. Nowhere in my testimony do I state that there are routes with zero possible deliveries for which load time can be measured, as your question appears to suggest.

(g) If there is no volume to be delivered, I would expect no street hours in any city carrier cost component. In this sense, the presence of fixed time along a carrier's route depends on route volume to be delivered. Once this fixed time or any variable carrier time is established by the delivery requirement, the potential for misclassification of carrier activity time exists. This apparently occurred with respect to load tallies as evidenced by both regression model results.

(h) I know of no instance where the USPS creates routes in geographical areas where there are no possible deliveries.

[No (i) interrogatory]

(j) I assume the reference to "part (h)" should be to part (g). See my response to part (g).

(k) I assume the reference to "part (i)" should be to part (h).

This question suggests confusion as to how the MPA model results should be interpreted. Any route load time/route possible deliveries curve should track along a continuum towards the origin and not a fixed positive point on the y intercept line. A positive y intercept for the MPA regression is evidence of that the ES estimate of load time includes more than true load time because there is no portion of load time that can remain fixed as route workload changes. The possible delivery variables that are part of the MPA regression are used as proxy workload variables.

The y intercept values from both the MPA and USPS models indicate that the ES load tallies include more than true load time. True load time varies fully with volume or possible deliveries, when used as a proxy for volume. The fixed time in both models indicate that there is a portion of carrier street time being classified as ES load which does not vary with volume or possible deliveries. Since route level fixed load time does not exist, this time must be some other component of carrier street time that has been included in the ES estimate of load time. Also see my response to part (g).

DECLARATION

I, Antoinette Crowder, declare under penalty of perjury that the foregoing answers are true and correct, to the best of my knowledge, information, and belief.

Antoinette Crowder

ANTOINETTE CROWDER

Dated: June 23, 2000

CERTIFICATE OF SERVICE

I hereby certify that I have on this date served the foregoing document upon all participants of record in this proceeding in accordance with section 12 of the Rules of Practice.

Thomas W. McLaughlin

June 23, 2000